COUNTER / TIMER

INSTRUCTION MANUAL

SD 1291 ✲ SD 1291A
Heterodyne Converter

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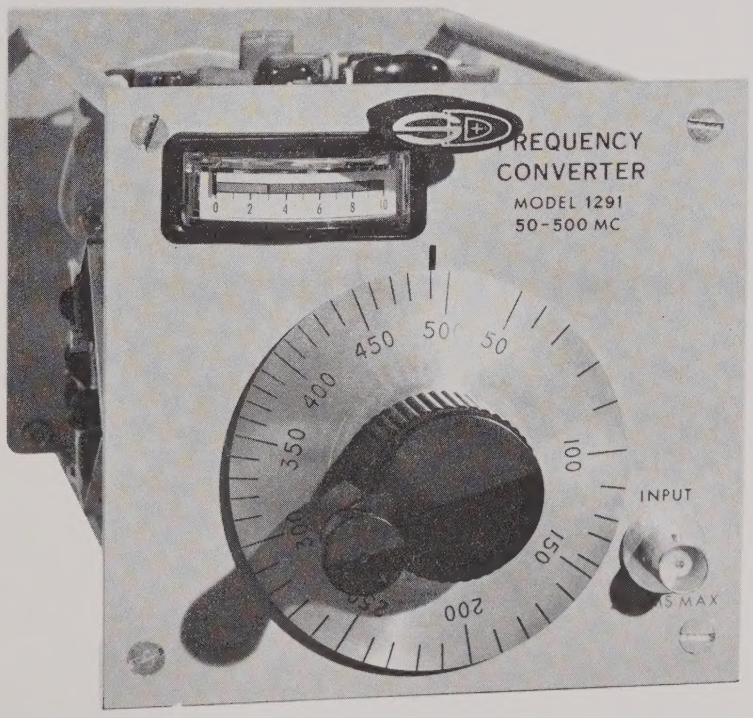
Serial No.

Date

Model 1291

FREQUENCY CONVERTER



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ERRATA

SD 1291 Instruction Manual

Please refer to Table 5-1 on Page 5-1 of this Instruction Manual.

The Extension Cable at the bottom of the Table is erroneously listed as Part Number 17341.

The correct Part Number is S23809.

This error also occurs in Table 5-3 on the next page.

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Chapter 1 — GENERAL INFORMATION

1-1 INTRODUCTION

The Systron-Donner Model 1921 Plug-in Adapter is a frequency converter of the 'Heterodyne' type. The Model 1291 operates over a range of 50 Mc to 510 Mc at a sensitivity of 50 mv rms. It is used in conjunction with either the S-D Model 1034H, 10 Mc Counter-Timer or the S-D Model 1037, 50 Mc Counter-Timer. Accuracy and stability of the measurements is the same as that of the basic counter.

A front panel meter monitors the output of the Model 1291 and provides an indication of when the Model 1291 is properly tuned. A reading within the green region of the meter indicates that the model 1291 is properly tuned; input signal amplitude is adequate; the output of the Model 1291 is sufficient to drive the the counter.

1-2 TECHNIQUE

The Model 1291 uses the 'Heterodyne' technique of measurement. A precise 10 Mc signal from the counter is applied to a harmonic generator. The output of the harmonic generator, containing all harmonics of 10 Mc, is then mixed with the input frequency. The harmonic resonator is then manually tuned to resonate at a particular harmonic of 10 Mc. The difference frequency between the input signal and the 10 Mc harmonic is detected, amplified and applied to the counter.

1-3 ACCESSORY

A four foot coaxial cable with Male BNC connectors on both ends is supplied with the Model 1291.

Table 1-1 Model 1291 Specifications

Input Frequency Range:	50 to 500 Mc
Output Frequency Range:	100 Kc to 10.1 Mc
Input Sensitivity:	50 Mv rms minimum
Maximum Usable Input:	1 v rms
Absolute Maximum Input:	2 v rms or 100 v dc
Input Impedance:	Approximately 50 ohms
Accuracy:	Same as counter used in (± Gate, ± Time Base drift, ± Loading)
Reads in:	Dial Reading ± counter indication in Mcs or Kcs
Resolution:	To 0.1 cps
Weight:	Net 5½ lbs., Shipping 9 lbs.

Chapter 2 — INSTALLATION

2-1 INITIAL INSPECTION

As soon as the Model 1291 is received, verify that the instrument is intact and as ordered. Inspect the Model 1291 for any physical damage such as scratched panel, broken knob, or bent connectors. If damage is found, refer to the warranty (inwardside of rear cover) and Paragraph 2-5 for shipping and repackaging instructions.

2-3 STORAGE AND RESHIPMENT

2-4 Environmental conditions during storage and shipment should be limited as follows:

a. Maximum temperature 185° F (85° C)
b. Minimum temperature −69° F (−55° C)

2 5 To protect your instrument during shipment or storage, use the best packaging methods available. Your Systron-Donner field office can provide materials similar to those used for original factory packaging. Contract packaging companies can provide dependable custom packaging on short notice.

a. If possible, use the original container designed for the instrument. Otherwise, use a strong carton (350 lb sq inch bursting strength) or wooden box to house the instrument.

b. Wrap the instrument in heavy paper or plastic before placing it in the shipping container.

c. Use plenty of packing material around all sides of the instrument and protect the front panel with card board strips.

d. Seal the package with strong tape or metal bands. Mark with "Delicate Instrument."

e. Refer to the warranty page at the rear of this manual and check with Systron-Donner field office for shipping instructions. All correspondence should refer to an instrument by model number and the full serial number.

2-6 INSTALLATION

2-7 To install the Model 1291 first turn the locking screw on the Counter front panel fully counter clockwise. Insert the Model 1291 in its compartment and push it towards the rear of the counter. Push firmly until the front panel of the Model 1291 is flush with the front of the counter. Turn the locking screw clockwise until tight.

To remove the Model 1291, loosen, the locking screw and with a firm pull remove the Model 1291 from its compartment.

2.8 POWER REQUIREMENTS

2-9 All power required by the Model 1291 is furnished by the counter in which it is installed. The Model 1291 requires approximately 10 Watts.

2-10 COOLING

2-11 The Model 1291 uses forced air cooling provided by a fan mounted on the inside rear panel of the counter.

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Chapter 3 — OPERATION

3-1 MEASUREMENT PROCEDURE

To use the Model 1291 perform the following steps:

a. Turn the DISPLAY control to MINIMUM.
b. Set RANGE to HET (omit this step when Model 1034H is used).
c. Place the TIME BASE switch in 10^{-4} position.
d. Place the FUNCTION switch to the RATE position.
e. If approximate frequency is known set dial, to nearest 100 Mc step below approximate frequency (for instance, if approximate frequency is 320 Mc set dial to 300 Mc). If frequency is unknown, set dial to 50 Mc.
f. Apply signal to Input BNC connector.
g. Slowly turn dial counter-clockwise (increasing mixer frequency) until FIRST maximum reading is observed on the panel meter. Meter reading must be in the green portion of the Meter.
h. (With Model 1037 only) Adjust the LEVEL control for a stable indication.
i. ADD the counter indication to the dial reading of the Model 1291.

3-2 VERIFICATION OF MEASUREMENTS

To verify the answer obtained in paragraph 3-1 perform the following steps:

a. Turn the Model 1291 dial counter clockwise until a second maximum reading is observed on the panel meter. This reading must also be in the green area of the meter.
b. SUBTRACT the counter indication from the dial reading. The answer should be the same as that obtained in the previous steps.

3-3 MEASUREMENT OF WEAK SIGNALS

Signals of less than 50 mv rms amplitude may be measured if care is taken. Follow the normal proceddure outlined in paragraph 3-1 and note the reading. Then, using the procedure in paragraph 3-2, take a second reading. If both readings agree the answer is valid.

Care must be taken in tuning the dial to the maximum possible deflection of the panel meter as meter deflection is critical in low amplitude signal measurements.

When using the Model 1291 in a Model 1037 the level control on the Model 1037 may be adjusted to obtain best results.

Table 3-1 Frequency Resolution

Measurement Time	Resolution
0.1 μs	Not a valid setting
1.0 μs	1 Mc
10 μs	100 Kc
100 μs	10 Kc
1 ms	1 Kc
10 ms	100 cps
100 ms	10 cps
1 sec	1 cps
10 sec	0.1 cps

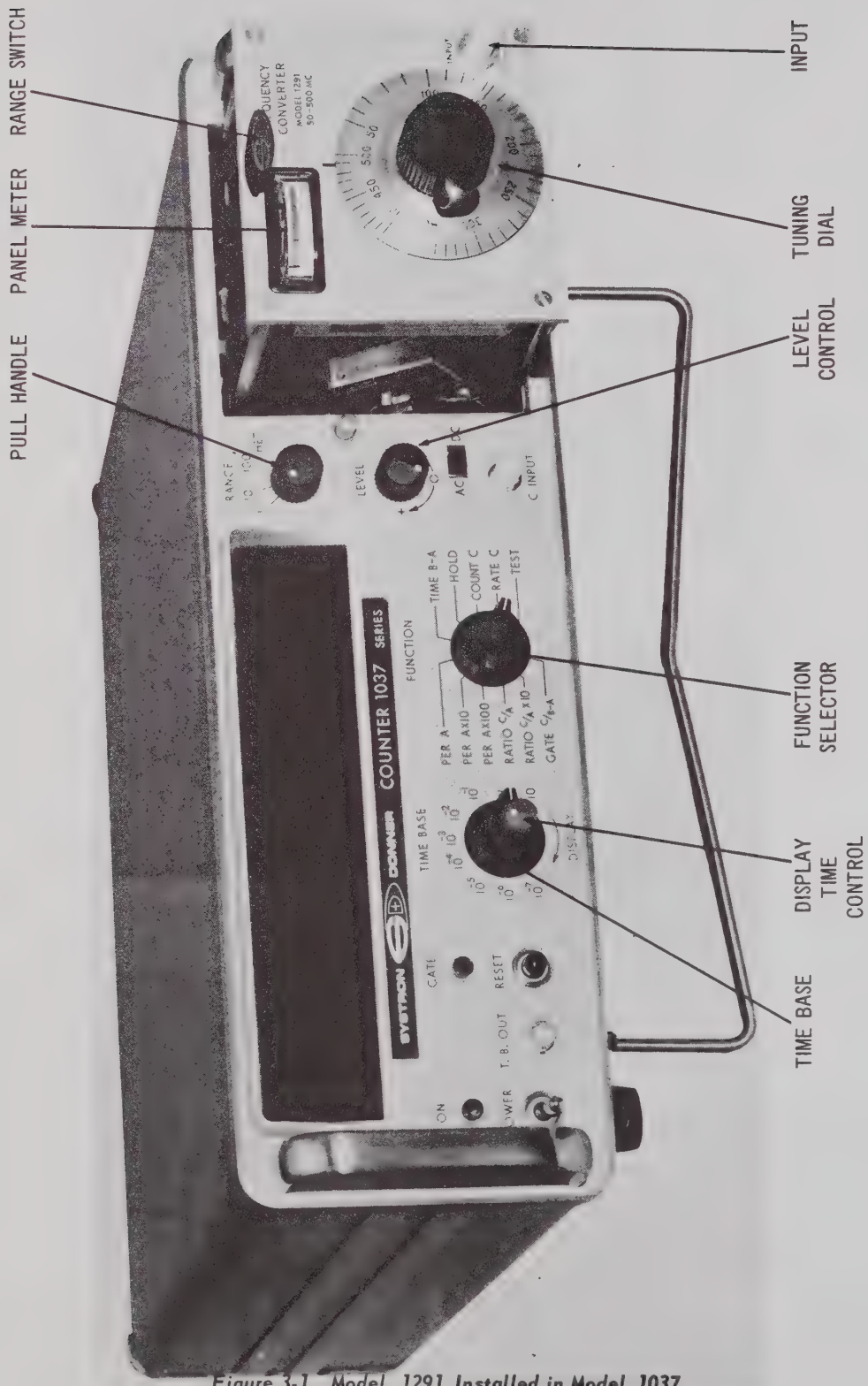


Figure 3-1 Model 1291 Installed in Model 1037

Chapter 4 — PRINCIPLES OF OPERATION

4-1 GENERAL OPERATING DESCRIPTION

The Model 1291 is a frequency converter based on the heterodyne principle. Basicly this technique consists of mixing two frequencies (F_1 and F_2) together to obtain a difference frequency ($F_1 - F_2$). In this application F_1 is the input frequency and F_2 is same harmonic of 10 Mcs. The dial of the Model 1291 is calibrated to indicate the frequency (F_2) that is mixed with the input frequency (F_1). The panel meter gives an indication only when the difference frequency ($F_1 - F_2$) is within the limits about 100 Kc to 10.1 Mc. Thus it is easily seen that the dial reading (F_2) plus the counter indication (difference frequency) must equal the input frequency (F_2 + difference frequency = F_1). This is the normal method of measuring an input frequency as indicated in paragraph 3-1.

There is another case where a usable difference frequency may be obtained. In this case the internal frequency (F_2) is higher than the input frequency (F_1) and the difference frequency equals $F_2 - F_1$. Again it is obvious that the input frequency must equal the dial reading minus the counter indication (F_2 – difference frequency = F_1). This indication and dial reading are used to validate the first answer as outlined in paragraph 3-2.

In practice a heterodyne converter consists of five main sections: mixer, driver amplifier, harmonic generator, harmonic selector cavity, and video amplifier (see Figure 4-1). These sections are explained in detail in the following sections.

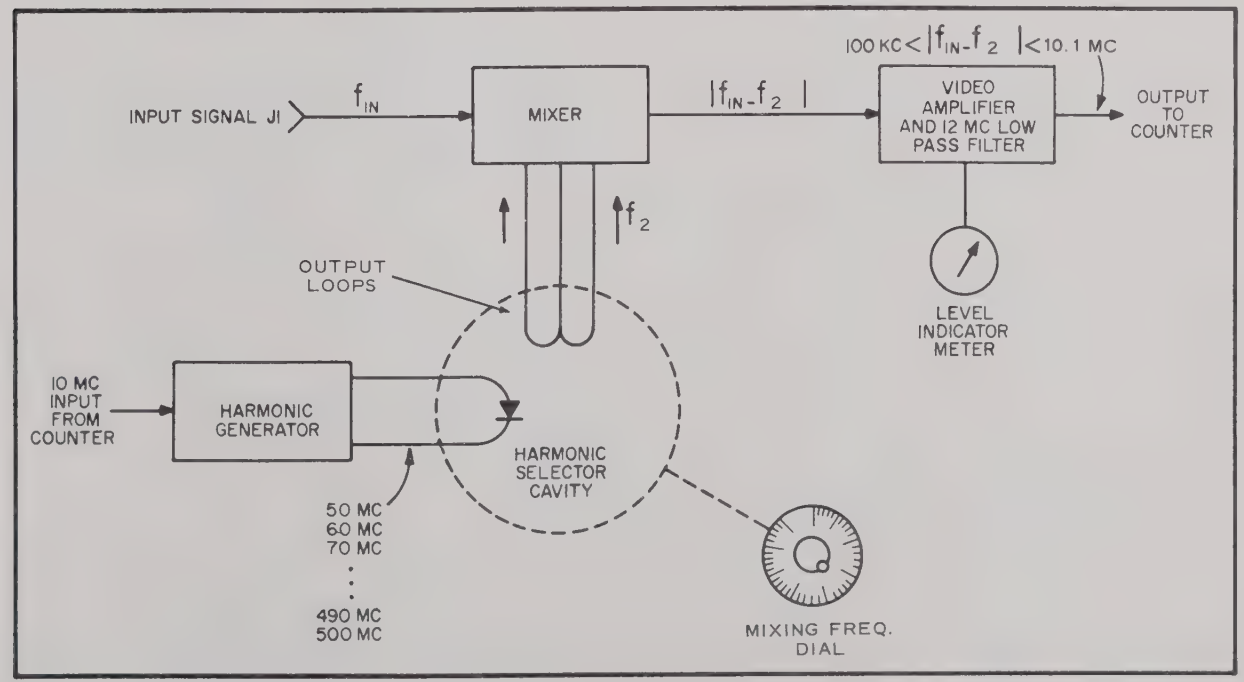


Figure 4-1 Block Diagram

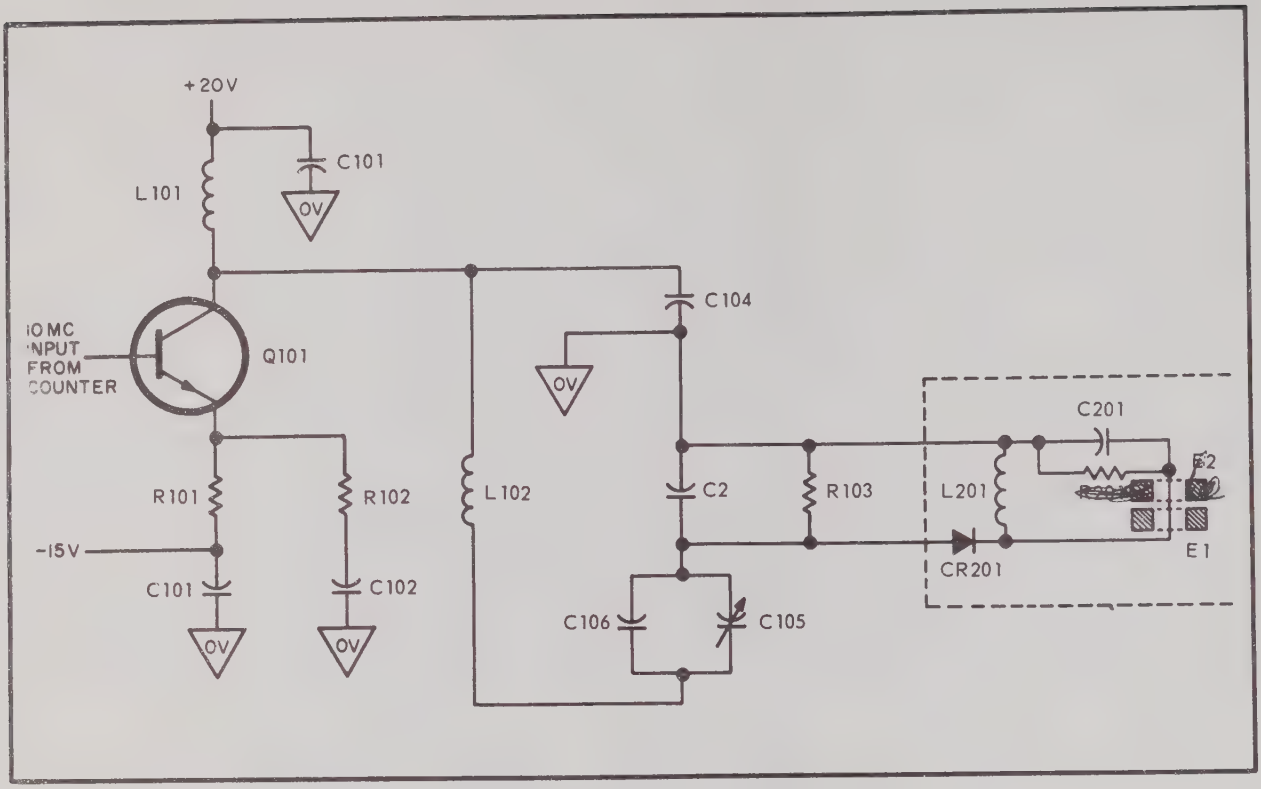


Figure 4-2 Driver Amplifier and Harmonic Generator

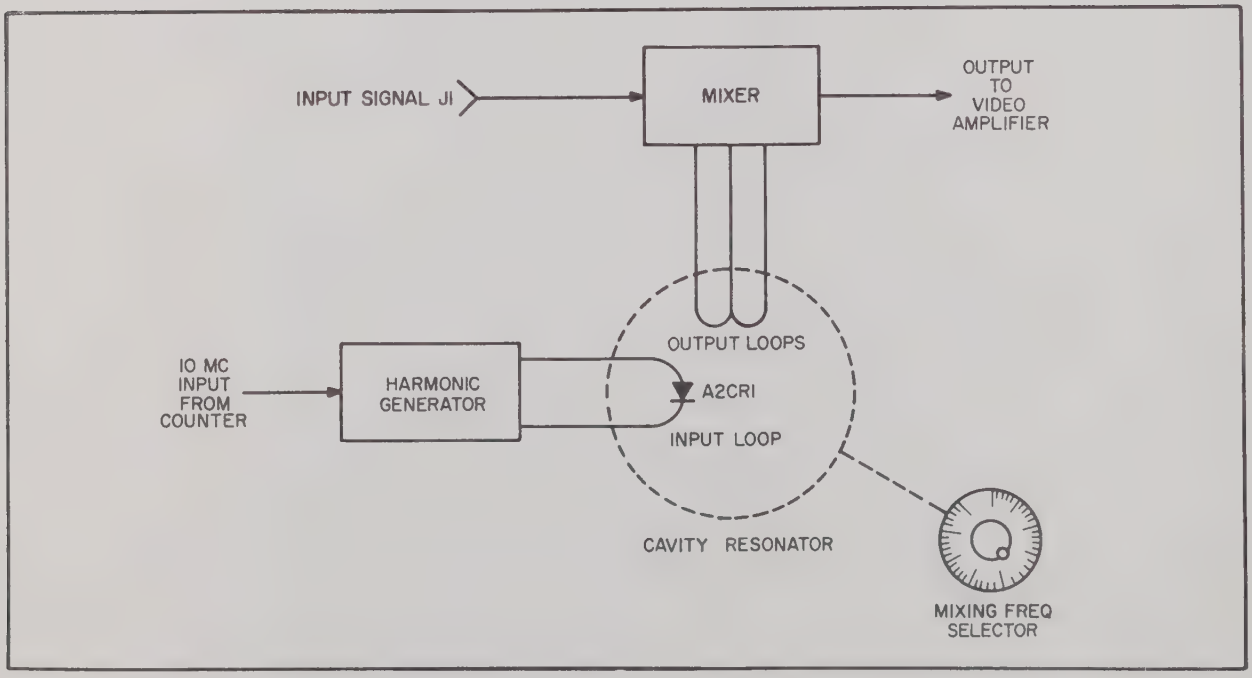


Figure 4-3 Harmonic Selector Cavity

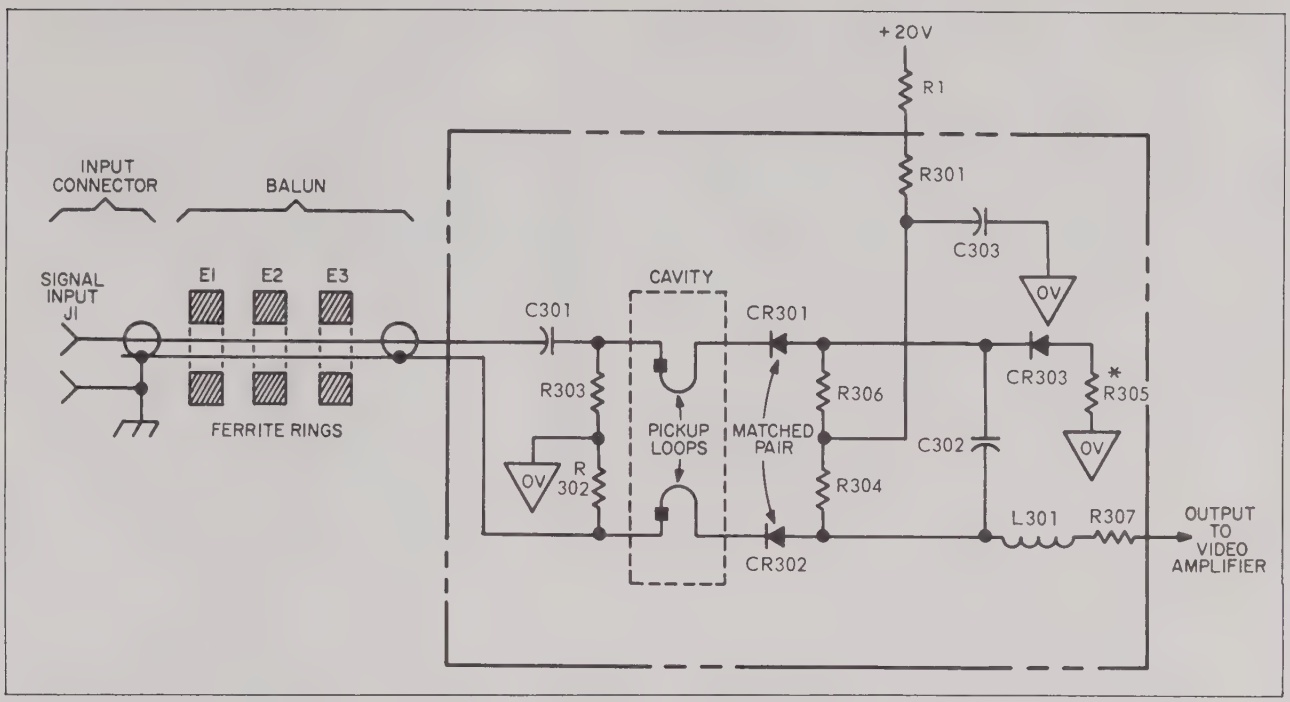


Figure 4-4 Balanced Mixer (Assembly 3)

4-2 DRIVER AMPLIFIER (Figure 4-2)

Q 101 amplifies the 10 Mc signal supplied by the counter. The 10 Mc signal is then filtered by the action of L102, C104, C105, C106 and C2 and applied to the harmonic generator. This action is necessary as the 10 Mc signal to the harmonic generator must be as free from other frequency components as possible.

4-3 HARMONIC GENERATOR

The harmonic generator consists of a step recovery diode, CR 201, placed inside the resonant cavity. The action of CR201 with its sharp steps in current makes all harmonics of 10 Mc available inside the resonant cavity. These harmonics will be 20 Mc, 30 Mc, 40 Mc, 50 Mc . . . . . 480 Mc, 490 Mc, 500 Mc

4-4 HARMONIC SELECTOR CAVITY (Figure 4-3)

The Harmonic Selector Cavity is a tunable resonant cavity which contains the harmonic generator and output loop's leading to the mixer. Its tuning plug is mechanically connected to the tuning dial so that as the dial is turned the cavity is tuned to a particular harmonic of 10 Mc. The output loops pick up this resonant frequency and supply it to the mixer when the heterodyne action with the input signal takes place. The tuning dial is calibrated to indicate the harmonic frequency that is resonant at any given point.

4-5 MIXER (Figure 4-4)

The balanced mixer accomplishes the heterodyne action and provides the difference frequency output. Both the input and harmonic signal are fed to the mixer and balanced by the action of R302 and R303. Note that R302 is at DC ground on both ends, however, the ferrite rings present a high impedance to the AC signal producing a balanced output to the mixing diodes. The mixing diodes, CR301 and CR302, are a matched pair and produce a complex signal containing F_1, F_2, $F_1 + F_2$, and $F_1 - F_2$. The action of inductor L301 attenuates all frequencies above approximately 10 Mc and thus effectively to output of the mixer is $F_1 - F_2$, the difference frequency.

4-6 VIDEO AMPLIFIER (Figure 4-4)

The Video Amplifier filters and amplifies the output signal from the mixer. The mixer output is amplified by Q401 and Q402; the amplified signal is then fed to the low pass filter. The low pass filter attenuates all signals above 12 Mc so as to further reduce the high frequency components present in the mixer output. Q403 and Q404 amplify the signal to make up for the losses in the low pass filter. The output to the counter is taken from Q404, emitter and is limited to approximately 300 mv rms by CR401. The output of Q404, collector is applied to the circuit for the front panel meter. R419 in the meter circuit is selected to make the meter read at the edge of the green area when the video amplifier output is 100 mv rms.

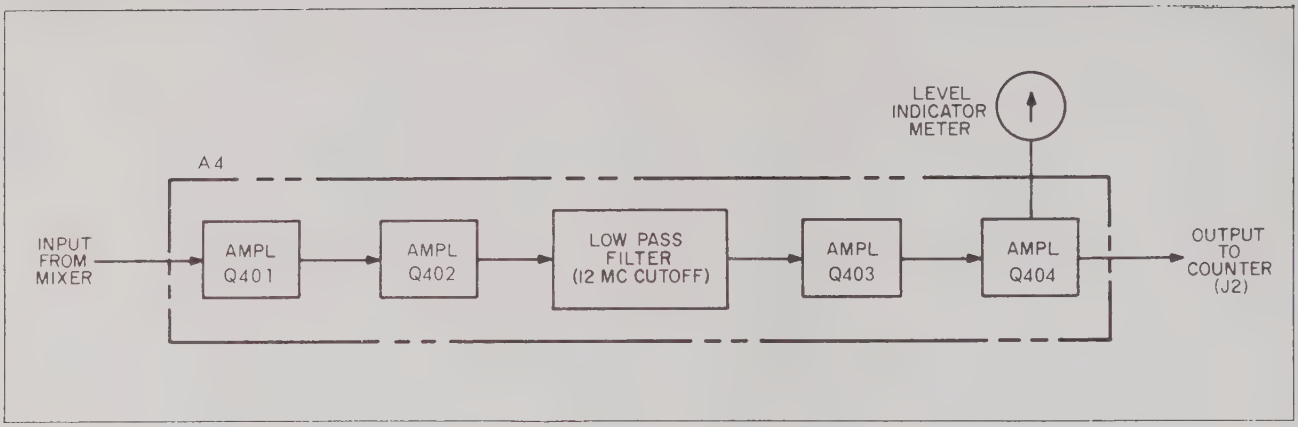


Figure 4-5 Video Amplifier (A1)

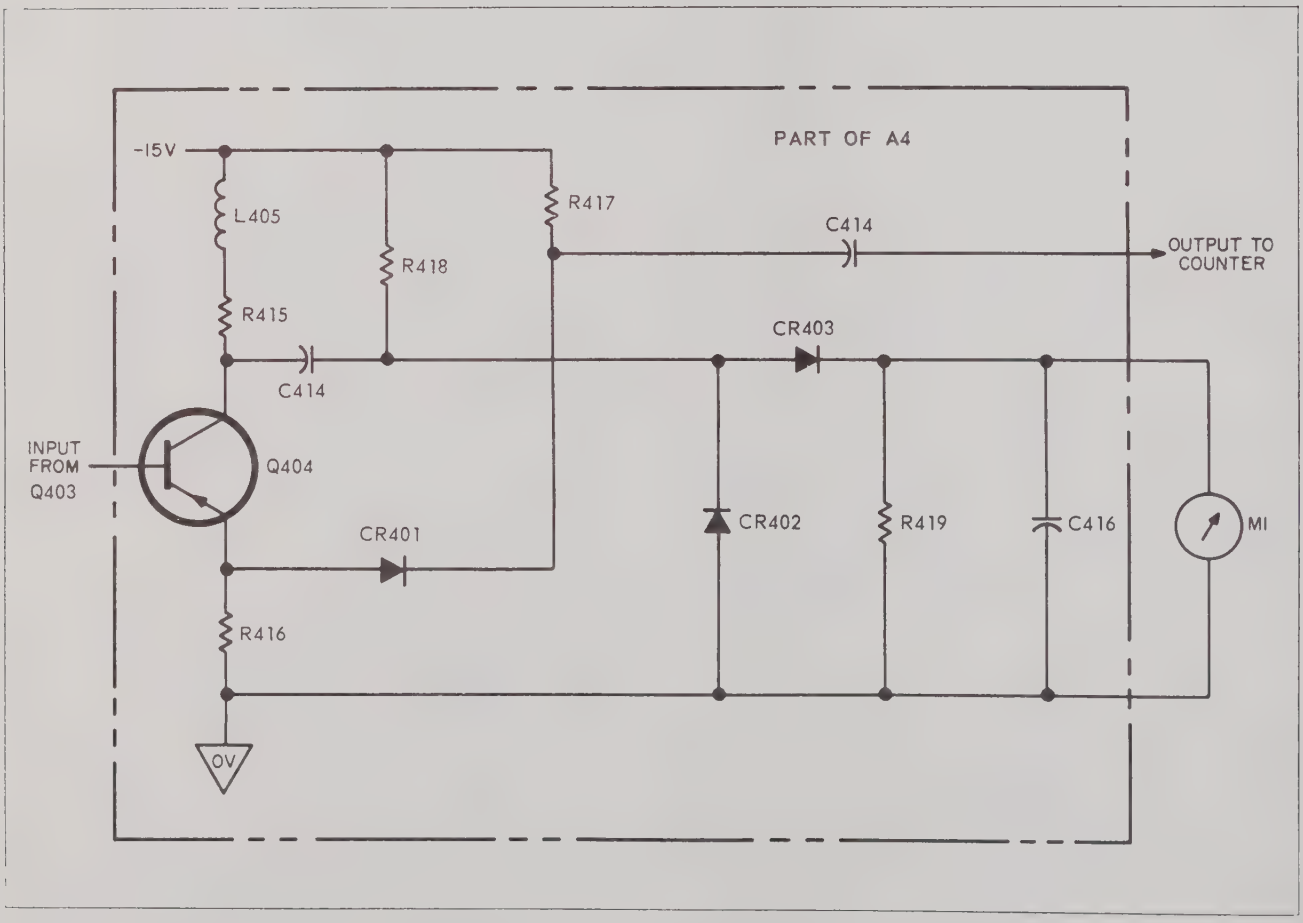


Figure 4-6 Level Indicator Meter Circuit

Chapter 5 — MAINTENANCE

5-1 GENERAL

5-2 *Introduction:*

5-3 This section contains information concerning periodic maintenance, troubleshooting and recommended test equipment, repair, circuit adjustments, and performance testing. A complete schematic diagram of the converter is at the rear of this section (Fig. 5-5).

5-4 *Periodic Maintenance*

5-5 No special maintenance procedures are required when the converter is operated in normal environments. However, if unit is subjected to operation in extremely dusty environments, periodically clean all gears with a lint-free cloth and apply a coating of light, petroleum base, open-gear grease to all gear teeth.

5-6 *Test Equipment*

5-7 All test instruments required for performance testing, troubleshooting, and circuit adjustment after repair are listed in Table 5-1. Instruments having equivalent specifications may be substituted for the specific instruments recommended.

5-8 TROUBLESHOOTING

5-9 Table 5-2 lists resistances from connecting pins on connector J1 to chassis (when unit is not connected to counter) to aid in troubleshooting. Table 5-3 is a suggested troubleshooting procedure which lists circuit conditions at Test Points throughout the converter. These Test Points are keyed to the component location drawings, Figures 5-1, 5-2, 5-3 and 5-4, and also to the schematic diagram, Figure 5-5. Voltages listed in Table 5-3 are approximate and may vary widely between instruments, due to variations in component values. Table 5-4 lists recommended adjustments to be made after repair of any section of the converter.

Table 5-2 Resistance Troubleshooting Aid

Location	Resistance (to Chassis)*
J1 – Pin 1	> 100 megohms
J1 – Pin 15	1 K ohms ± 20%
J1 – Pin 20	140 K ohms ± 20%
J1 – Pin 25	125 K ohms ± 20%

*Unit not connected to counter.

5-10 REPAIR AND REPLACEMENT

5-11 Paragraphs 5-12 through 5-19 are replacement procedures to aid in repair of the converter. Detailed procedures for replacement of all the individual components of the unit are beyond the scope of this manual. In-field repair is, for the most part, simple and straightforward. However, **do not attempt adjustment of the gearing arrangement, the harmonic selector cavity or the step-recovery diode.** Should gear, cavity, or step recovery diode problems arise, please contact your Systron-Donner field office to arrange for repair.

Table 5-1 Recommended Test Equipment

Instrument	Required Characteristics	Use	Instrument Recommended
Electronic Counter		Supply Power, Visual Operational Indicator	Systron-Donner Model 1037 or 1034H
RF Millivoltmeter	1 Mc to 20 Mc 10 mv to 10 vdc 10 mv resolution	Circuit Adjustment, Troubleshooting	Hewlett-Packard Model 411A with Pen Type Probe Tip, 11022A
DC VM and Ohmmeter	0 to ±25 vdc 0.1 v resolution 0 to 100 M ohms	Circuit Adjustment, Troubleshooting	Simpson Model 260
VHF Signal Generator	50 Mc to 480 Mc 10 mv to 1 v	Circuit Adjustment, Troubleshooting	Hewlett-Packard Model 608C
Oscilloscope	15 Mc bandwidth	Circuit Adjustment, Troubleshooting	Tektronix Model 541 with High Gain Amplifier Unit
Extension Cable	50 pin straight-thru connections	Circuit Adjustment, Troubleshooting	No. 17341

Table 5-3 Troubleshooting Procedure

All voltages given are approximate and may vary from instrument to instrument because of variations in component characterists.

TEST EQUIPMENT: Model 411A RF Millivoltmeter with Pen Type Probe Tip, Simpson

REMOVE 1291 FROM COUNTER; SELF-CHECK COUNTER			See counter manual for self-check procedure.
CONNECT 1291 TO COUNTER WITH EXTENSION CABLE,			Extension Cable No. 17341
TP1	+20 VDC		Checks power supplied to plug-in from counter; see counter manual for power supply adjustment procedure.
TP2	+15 VDC		
TP3	+6 VDC	2.5 V PP	Checks 10-Mc drive of harmonic generator.
TP4	+2 VDC 2 VAC		Checks generator diode drive. Voltages vary widely because of both the detuning effect of voltmeter probe and the variable value of R103; DC voltage may be either + or −, depending upon factory determined generator diode orientation.
TP5	+100 MV DC		Voltages vary widely because of diode characteristics. Voltages are 0 VDC when diode shorted, and +20 VDC when diode open. Voltages should be approximately equal because of matched characteristics.
TP6	+100 MV DC		

Connect Signal Generator to 1291. Set Generator to 52 Mc, CW, 100 MV.

Set Counter Controls and 1291 to measure frequency of Input Signal.

TP7	5 MV RMS	This voltage is total harmonic energy output of mixer and varies widely.
TP8	+6 VDC 15 MV RMS	Checks bias and amplification of Q401
TP9	+10 VDC 200 MV RMS	Checks bias and amplification of Q402
TP10	+4 VDC 15 MV RMS	General check of low pass filter section
TP11	+9 VDC 500 MV RMS	Checks bias and amplification of Q403
TP12	+8.5 VDC 300 MV RMS	Checks operation of Q404
TP13	0 VDC 200 MV RMS	Checks operation of limiter, CR401
TP14	0 MV DC when meter reads at left end of scale; 50 MV DC when meter reads full scale; 15 MV DC when Test Point No. 13 is 100 MV RMS, and meter reads at red-green border.	Checks accuracy of meter circuit in relation to output to counter.

5-12 VIDEO AMPLIFIER

5-12 Video Amplifier Assembly Replacement

5-13 If video amplifier printed circuit board requires replacement, follow this procedure:

a. Remove the converter from counter.

b. Unscrew and remove small screw which holds video amplifier in place.

c. Firmly grasp assembly at component-free end and pull out of socket using a slight back-and-forth sideways movement.

d. Check that the connecting terminals of replacement assembly are clean. Push replacement assembly firmly into socket and check for proper seating.

e. All replacement video amplifier assemblies are adjusted and inspected at the factory for optimum performance. However, if a general operational check is desired, perform the in-cabinet performance check given in paragraph 5-29.

5-14 Mixer Diode Replacement

5-15 If either of the matched pair of mixer diodes (CR 301 or CR301) is found to be defective, both diodes should be replaced. The recommended replacement procedure is as follows:-

a. Remove diodes from spring clips, noting orientation.

b. Install replacement diodes with same orientation.

b. Perform the sensitivity check (paragraph 5-28) to insure that converter operation is within specifications.

5-16 Meter Replacement Procedure

5-17 If the level indicator meter requires replacement, follow this procedure:

a. Remove converter from counter.

b. Unscrew and remove small retaining screw which holds video amplifier board in place. Remove screws which secure supporting bracket to front panel. Remove supporting bracket.

c. Firmly grasp video amplifier board at the component-free end and pull board out of socket using a slight back-and-forth sideways movement.

d. Place converter on bench with bottom plate resting on bench surface and with the front panel facing to the the rear of the bench.

e. Remove the screw which holds aluminum space-rod to plastic rear-support. Grasp space-rod and turn counterclockwise to remove rod from front support.

f. Cut connecting wires at meter terminals.

g. Remove screws from meter bezel at sides of meter. Push bezel forward as far as possible.

h. Remove screws on top of meter bracket.

i. Grasp meter and gently pull meter (and bracket) backwards out of front panel hole, at the same time twisting rear of meter slightly sideways to the right and pulling up.

j. Remove bracket and hardware from meter and install in identical manner on replacement meter. Hardware which may came from the manufacturer with the replacement meter may be discarded.

k. Place meter (with bracket) in unit by reversing removal procedure.

l. Replace screws on top of meter bracket.

m. Replace meter bezel at sides of meter.

n. Check that meter terminals are not close to front bearing-block. Bend terminals away from block if necessary.

o. Strip ¼ inch insulation from ends of each connecting wire and solder to meter terminals. Black wire goes to inside terminal and white wire goes to outside terminal.

p. Replace aluminum spacer-rod. Tighten only "finger-tight" as excessive torque may break end of rod.

q. Replace screw which holds spacer-rod to rear support.

r. Replace video amplifier assembly, supporting bracket, and all screws.

5-18 DRIVER AMPLIFIER ADJUSTMENT

5-19 To adjust the driver amplifier assembly, proceed as follows:

a. Remove converter from counter and reconnect to counter with Extension Cable, No. 17341.

b. Connect VHF Signal Generator to converter INPUT and set to 472 Mc, CW, at 100 mv.

c. Connect RF Millivoltmeter to Test Point No. 13. (See Figure 5-2).

d. Set converter mixing frequency control to 470 Mc, and tune for maximum reading on RF Millivoltmeter.

e. Vary output of VHF Signal Generator to make converter level indicator meter read at red-green border.

f. Using plastic tuning tool, tune C105 (see Figure 5-2) for maximum reading on RF Millivoltmeter. Tune C105 through holde in assembly shield cover.

5-20 LOW PASS FILTER ADJUSTMENT

5-21 To adjust the low pass filter in the video amplifier assembly, proceed as follows:

a. Remove converter from counter and reconnect to counter with Extension Cable, No. 17341.

b. Connect VHF Signal Generator to converter INPUT and set to 110 Mc, CW, at 50 mv.

c. Connect RF Millivoltmeter to Test Point No. 13 (see Figures 5-4 and 5-5).

d. Set converter mixing frequency control to 100 Mc and tune for maximum reading on RF Millivoltmeter.

e. Set Signal Generator to 118 Mc, CW, at 1 v.

f. Using plastic tool, adjust variable inductor L404 (see Figures 5-1 and 5-5) for minimum reading of RF Millivoltmeter.

g. Set Signal Generator to 117 Mc, CW, at 1 v.

h. Using plastic tool, adjust variable inductor L402 (see Figures 5-1 and 5-5) for minimum reading of RF Millivoltmeter.

i. Set Signal Generator to 115 Mc, CW, at 1 v.

j. Reading of RF Millivoltmeter should be less than 100 mv. If reading is above 100 mv, troubleshoot video amplifier assembly.

5-22 Meter Calibration Adjustment (pri.)

a. Turn counter power off, remove converter from counter, and reconnect to counter with Extension Cable, No. 17341.

b. Set VHF Signal Generator to 102 Mc, CW, at 50 mv and connect to INPUT of converter.

c. Set counter controls as shown in Figure 3-2. Counter should display approximately 2 Mc.

d. Vary VHF Generator output to make level indicator meter read at red-green border.

e. Using RF Millivoltmeter, measure voltage at Test Point No. 13. Voltage should be between 100 mv and 130 mv. If not, change value of resistor R19 to change voltage to between 100 mv and 130 mv. If voltage is too high, increase value of R417. If voltage is too low, decrease value of R417. Repeat steps d and e after changing value of R417.

5-23 MECHANICAL ADJUSTMENT OF METER ZERO

5-24 True Signal Level Indication.

Level indicator meter is adjusted at the factory for proper mechanical zero. However, normal aging of meter components may change indicated zero level. To insure accuracy of input signal level indication, periodic adjustment of meter zero may be necessary.

5-25 Zero-Set

When meter is properly zero-set, pointer rests over the zero calibration mark at the left-hand end of meter scale when converter is (1) at normal operating temperature, (2) in normal operating position, and (3) without power. Proceed as follows:

a. Allow counter and converter to operate for one hour to permit meter movement to reach normal operating temperature.

b. Turn counter off and allow one minute for all capacitors to discharge.

c. Remove converter from counter to enable access to rear of meter.

d. Remove adhesive-backed-paper cover from meter zero-adjustment access hole on top-rear of meter.

e. Carefully insert small tool in access hole and engage adjustment fork.

f. Vary setting of adjustment fork until meter reads zero.

g. Remove tool and replace adhesive-backed-paper cover on access hole. This completes meter zero adjustment procedure.

Table 5-4 Adjustments after Repair

After Replacing Component in this Section:	PERFORM:
Driver Amplifier (Assembly 1)	Driver Amplifier Adjustment (Paragraph 5-18)
Mixer Assembly 3	Sensitivity Check (Paragraph 5-26)
Q401	Sensitivity Check (Paragraph 5-26)
Q402	Sensitivity Check (Paragraph 5-26), and Low Pass Filter Adjustment (Paragraph 5-20)
Low Pass Filter	Sensitivity Check (Paragraph 5-26), and Low Pass Filter Adjustment (Paragraph 5-20)
Q403	Sensitivity Check (Paragraph 5-26), and Low Pass Filter Adjustment (Paragraph 5-20)
Q404	Sensitivity Check (Paragraph 5-26), and Low Pass Filter Adjustment (Paragraph 5-20)
Meter Circuit	Meter accuracy check (Paragraph 5-27)

5-26 SENSITIVITY CHECK

a. Turn counter power off, remove converter from counter, and reconnect to counter with Extension Cable, No. 17341.

b. Set VHF Signal Generator to 52 Mc, CW, at 50 mv and connect to INPUT of converter.

c. Adjust controls as shown in Figure 3-2.

d. Set converter mixing frequency control to 50 Mc. Counter should display approximately 2 Mc.

e. Using RF Millivoltmeter, measure output of converter at Test Point No. 13 (see Figures 5-4 and 5-5). Voltage should be at least 100 mv.

f. Repeat above steps c, d, and e with VHF Generator frequency of 472 Mc and converter mixing frequency control set to 470 Mc. Converter output to counter, as measured by RF Millivoltmeter, should be at least 100 mv.

g. A similar check may be made at any frequency within the range of the Model 1291. Converter output to counter should be at least 100 mv when difference frequency is between 100 kc and 10 Mc and converter is properly tuned.

5-27 METER ACCURACY CHECK

a. Turn counter power off, remove converter from counter, and reconnect to counter with Extension Cable, No. 17341.

b. Set VHF Signal Generator to 102 Mc, CW, at 50 mv and connect to INPUT of converter.

c. Set controls as shown in Figure 3-2. Set converter mixing frequency control to 100 Mc. Counter should display approximately 2 Mc.

d. Vary output of VHF Signal Generator for converter level indicator to make meter read at red-green border.

e. Using RF Millivoltmeter, measure converter output to counter at Test Point No. 13. Voltage should be between 100 mv and 130 mv. If not, see paragraph 5-22 for meter calibration adjustment procedure.

5-28 LOW PASS FILTER CHECK

a. Turn counter power off, remove converter from counter and reconnect to counter with Extension Cable, No. 17341.

b. Set VHF Signal Generator to 110 Mc, CW, at 50 mv and connect to INPUT of converter.

c. Set controls as shown in Figure 3-2. Set converter mixing frequency control to 100 Mc. Counter should display approximately 10 Mc.

d. Connect RF Millivoltmeter to Test Point No. 13. Vary output of VHF Signal Generator for RF Millivoltmeter reading of 100 mv. Note output level of VHF Signal Generator.

e. Set VHF Signal Generator to 115 Mc at same output level as noted in step d above. Converter output to counter, as shown on RF Millivoltmeter, should not exceed 50 mv. If converter output to counter is greater than 50 mv, see Paragraph 5-23 for low pass filter adjustment procedure.

5-29 IN-CABINET PERFORMANCE CHECK

a. Turn counter power off and install converter.

b. Set VHF Signal Generator to 52 Mc, CW, at 50 mv and connect to INPUT of converter.

c. Set controls as shown in Figure 3-2. Counter should display approximately 2 Mc.

d. Set VHF Signal Generator to any frequency between 50 Mc and 510 Mc with output of 50 mv. Counter should display correct frequency at any frequency within this range.

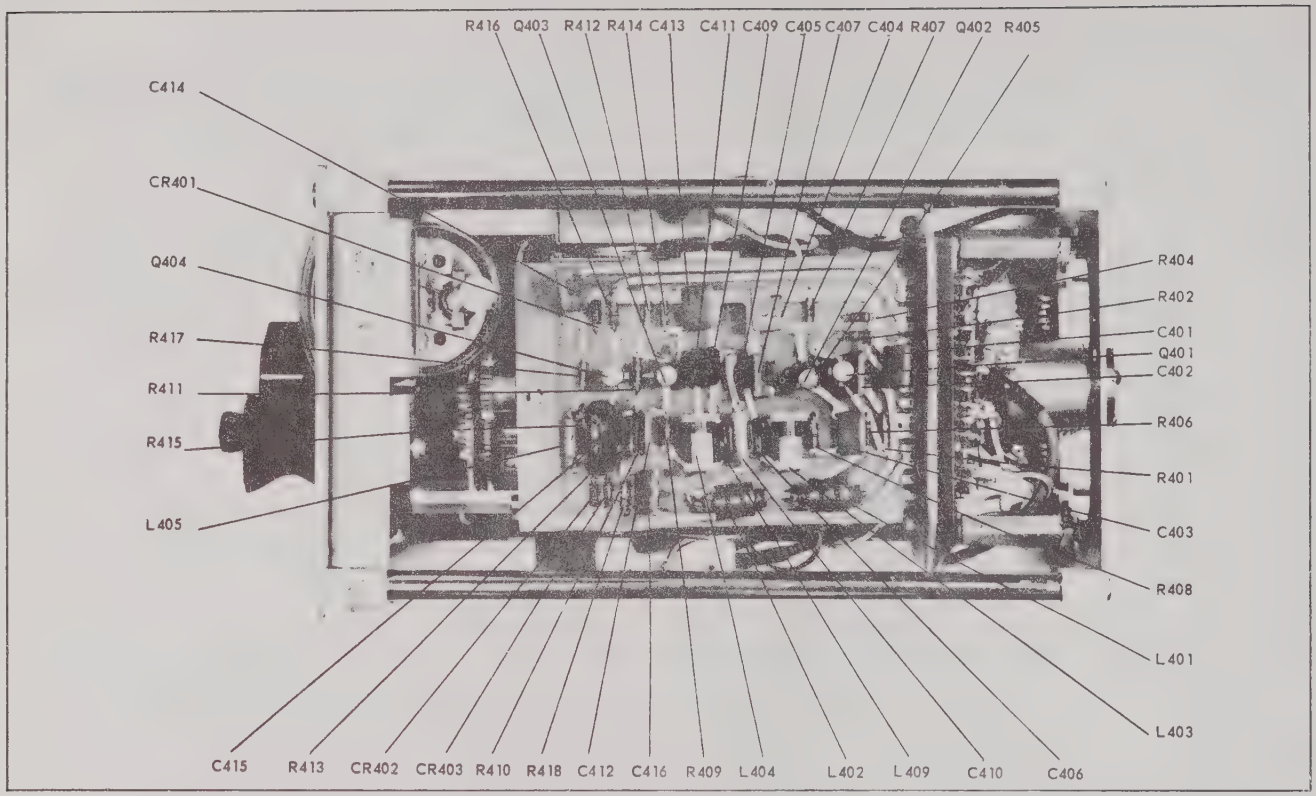


Figure 5-1 Top View

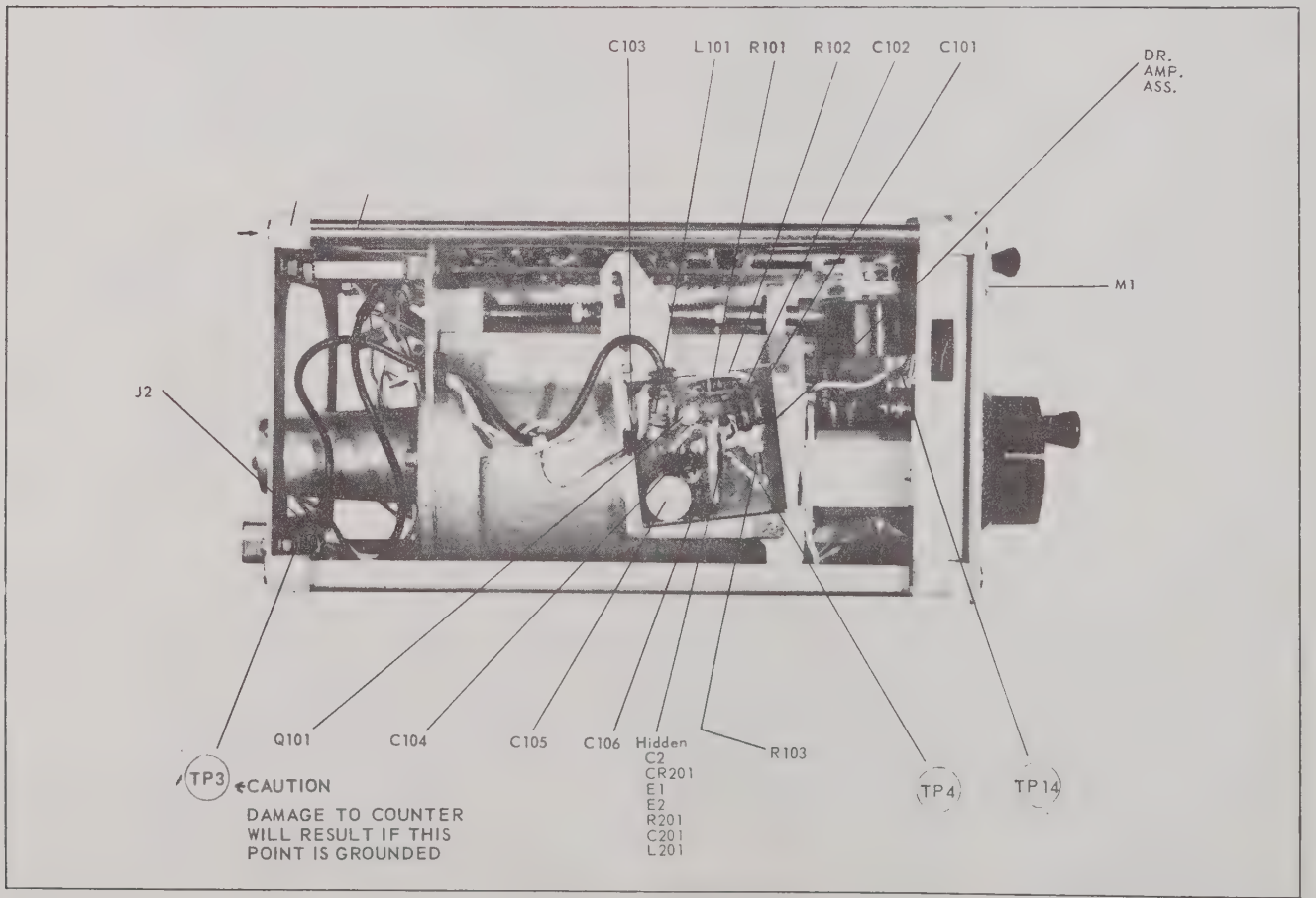


Figure 5-2 Left Side View

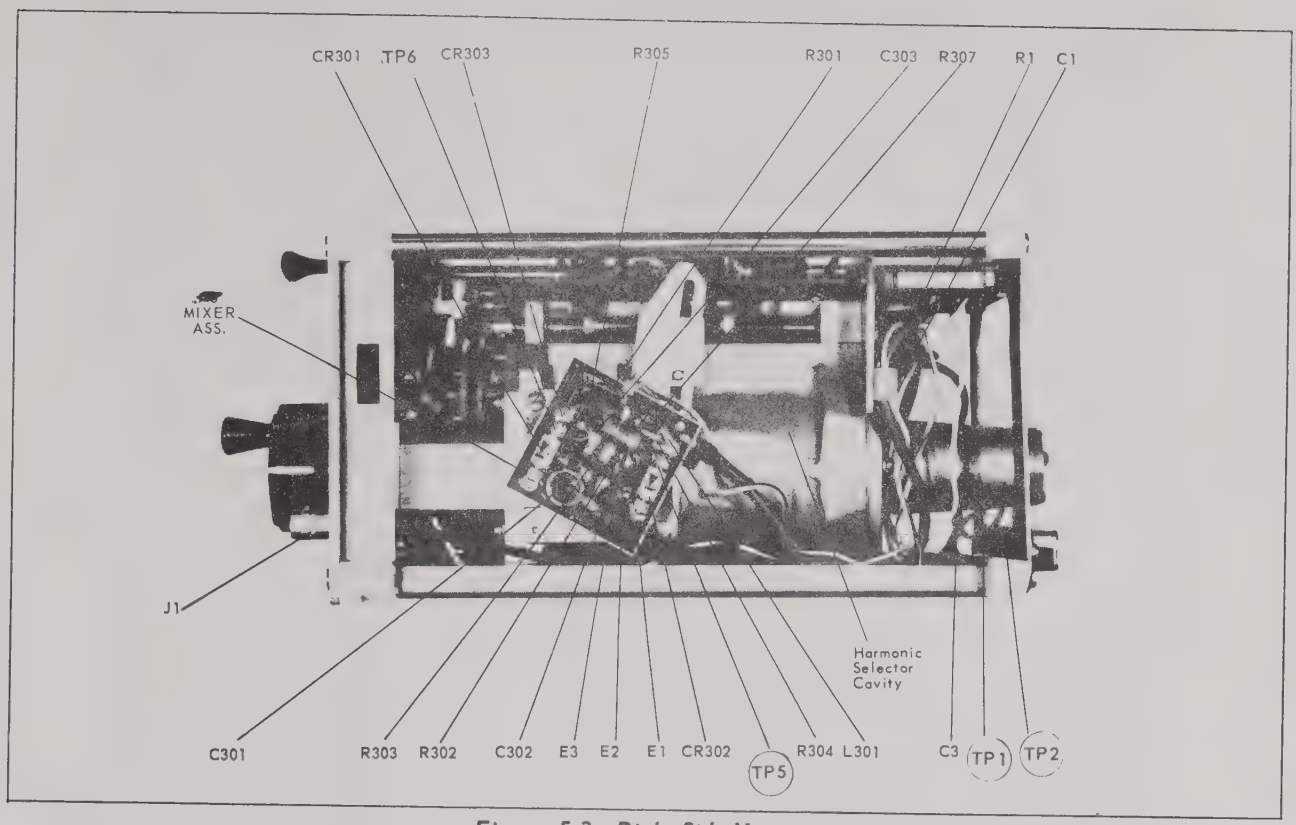


Figure 5-3 Right Side View

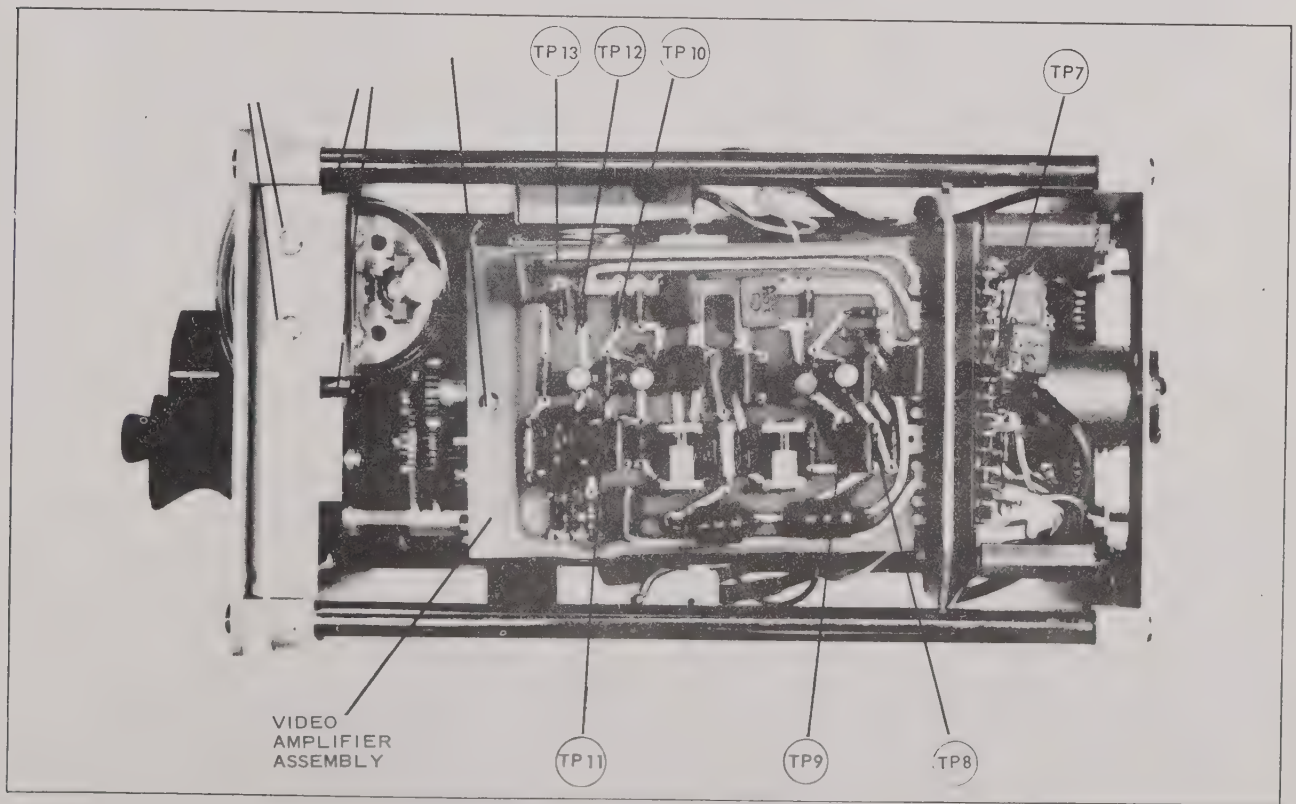
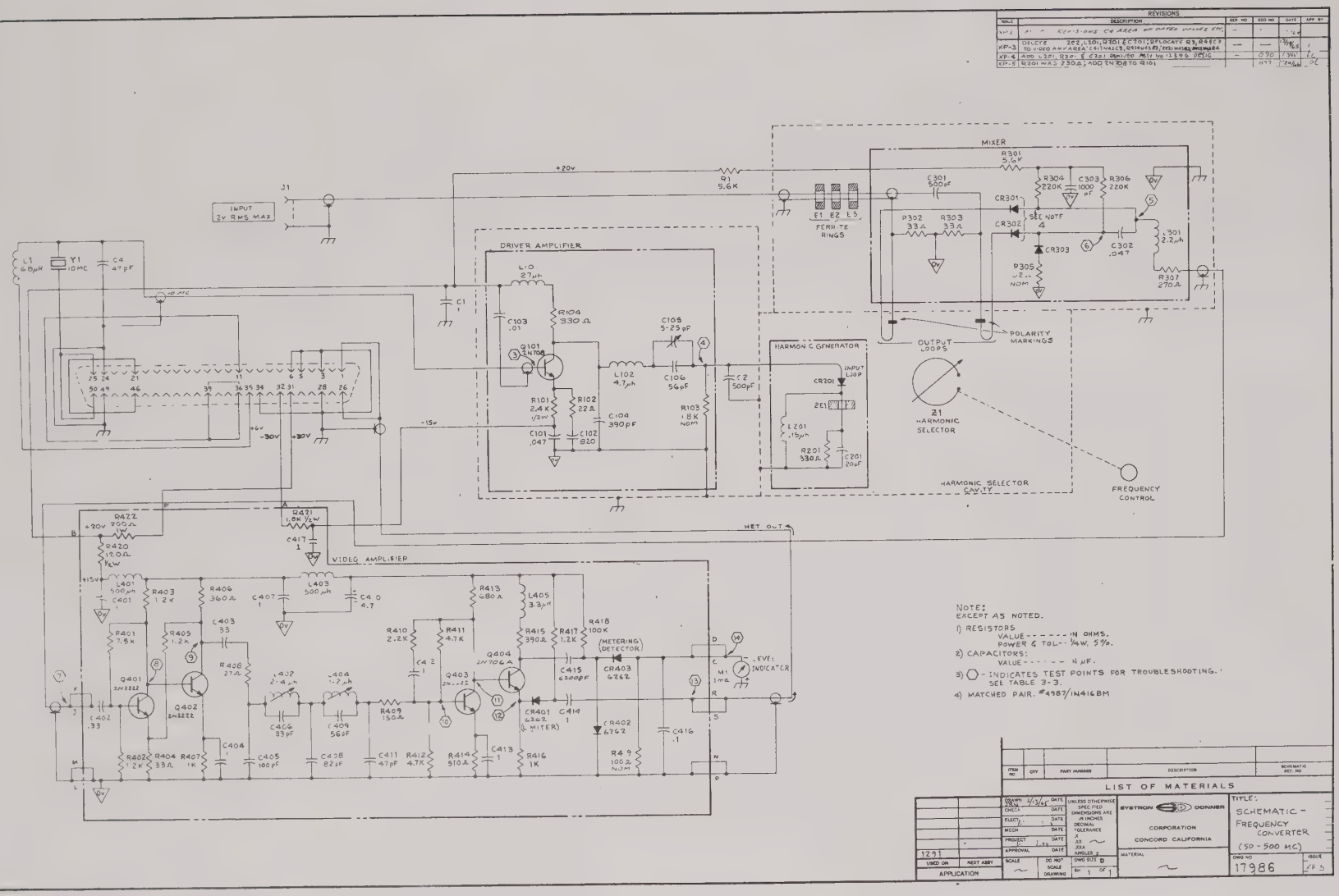


Figure 5-4 Top View – Test Points


REVISIONS
DESCRIPTION
REF. NO
ECO NO
DATE
APP. BY
XP-3
XP-4
XP-5
INPUT 2V RMS MAX
J1
+20V
R1 5.6K
MIXER
R301 5.6K
C301 500pF
R304 220K
C303 1000 pF
R306 220K
CR301
CR302
CR303
SEE NOTE 4
R302 33Ω
R303 33Ω
C302 .047
L301 2.2μh
R305 ~2Ω NOM
R307 270Ω
E1 E2 E3 FERRITE RINGS
OUTPUT LOOPS
POLARITY MARKINGS
DRIVER AMPLIFIER
L101 27μh
R104 330Ω
C103 .01
Q101 2N706
R101 2.4K 1/2W
R102 22Ω
C101 .047
C102 820
C104 390pF
L102 4.7μh
C105 5-25pF
C106 56pF
C2 500pF
R103 1.8K NOM
HARMONIC GENERATOR
CR201
INPUT LOOP
Z1
L201 .15μh
R201 330Ω
C201 20pF
Z1 HARMONIC SELECTOR
HARMONIC SELECTOR CAVITY
FREQUENCY CONTROL
L1 6.8μH
Y1 10MC
C4 47pF
C1
+6V
-30V
-15V
R422 200Ω
R421 1.8K 1/2W
R420 120Ω 1/2W
C417 1
VIDEO AMPLIFIER
RET. OUT
L401 500μh
C401
L403 500μh
C407 1
C4,9 4.7
R403 1.2K
R406 360Ω
R401 7.5K
R405 1.2K
C403 33
R408 27Ω
Q401 2N3122
Q402 2N2222
C402 .33
L402 2-4μh
L404 1-2μh
C406 33pF
C409 56pF
C404
C405 100pF
C408 82pF
R402 1.2K
R404 33Ω
R407 1K
C411 47pF
R412 4.7K
R414 510Ω
C413 1
R416 1K
R409 150Ω
R410 2.2K
C412 1
R411 4.7K
R413 680Ω
L405 3.3μh
R415 390Ω
R417 1.2K
R418 100K
(METERING DETECTOR)
C415 6200pF
CR403 6262
Q404 2N706A
Q403 2N...25
CR401 6262 (LIMITER)
C414 1
CR402 6262
R419 100Ω NOM
C416 .1
M1 1ma.
LEVEL INDICATOR
NOTE:
EXCEPT AS NOTED.
1) RESISTORS
VALUE - - - - - - IN OHMS.
POWER & TOL - - ¼W, 5%.
2) CAPACITORS:
VALUE - - - - - - IN μF.
3) ⬡ - INDICATES TEST POINTS FOR TROUBLESHOOTING. SEE TABLE 3-3.
4) MATCHED PAIR. #4987/1N416BM
LIST OF MATERIALS
ITEM NO
QTY
PART NUMBER
DESCRIPTION
SCHEMATIC REF. NO
DRAWN
CHKD.
ENGR.
MECH
PROJECT
APPROVAL
DATE
4/3/65
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ±TOLERANCE
X ±
XX ±
XXX ±
ANGLES ±
SCALE
DO NOT SCALE DRAWING
DWG SIZE D
SHT 1 OF 1
1291
USED ON
NEXT ASSY
APPLICATION
SYSTRON DONNER
CORPORATION
CONCORD CALIFORNIA
MATERIAL
TITLE:
SCHEMATIC - FREQUENCY CONVERTER (50 - 500 MC)
DWG NO
17986
ISSUE
XP-5

ADDENDUM

MODEL 1291A

The Model 1291A is very similar to the Model 1291 described in this manual. The changes incorporated in the Model 1291A in no way affect the operation or specifications described herein.

The changes noted in this addendum were incorporated to improve the reliability and increase the ease of maintenance of the Model 1291.

PARTS LIST

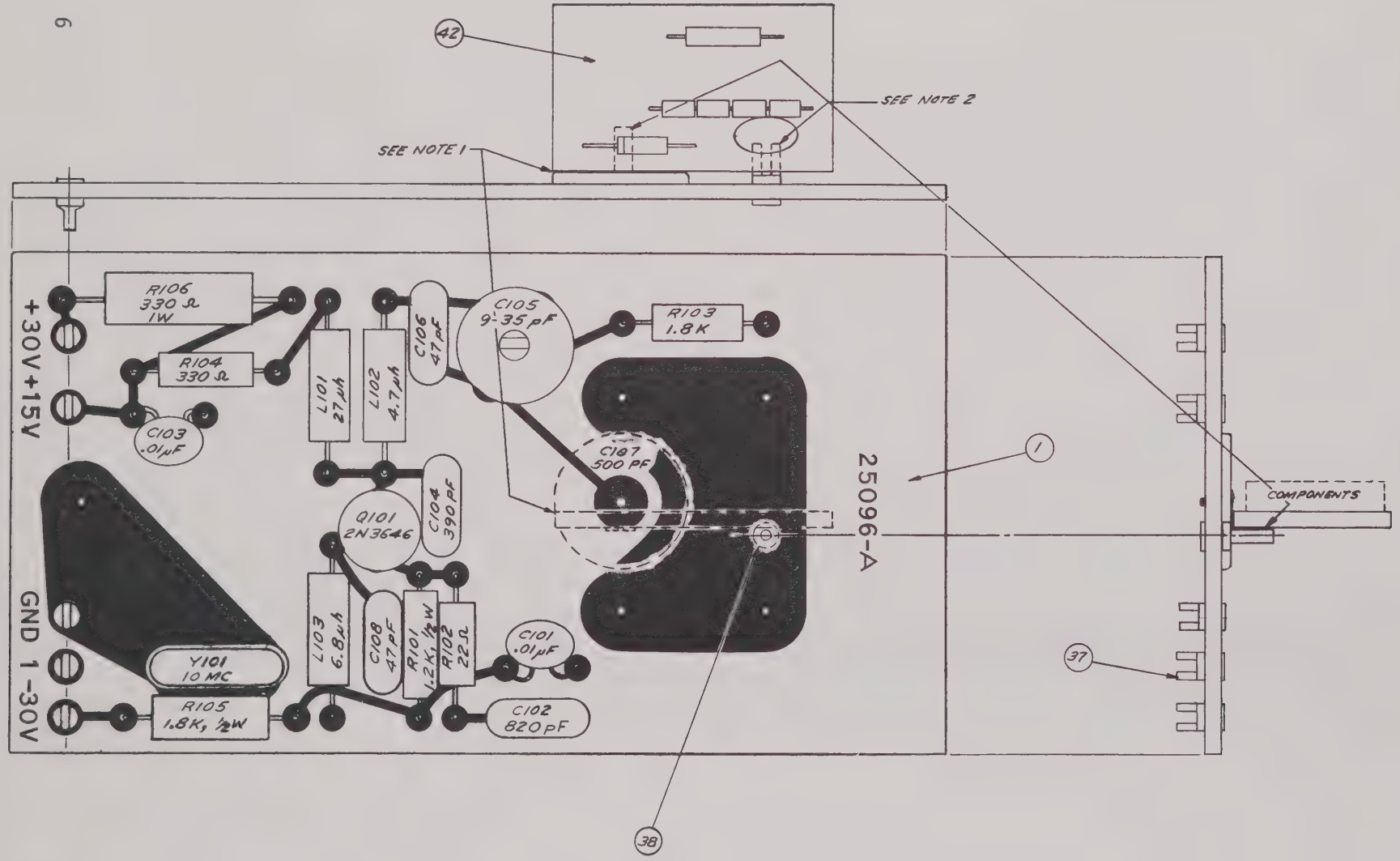
REFERENCE	DESCRIPTION	PART NUMBER
	Driver Amp PC Assy	
25123	**Schematic**	
25095	**PC Board**	
C101	Capacitor, .01 µf, 150v DISC	C0233
C102	Capacitor, 820 pf, 10%, 300V	C0681
C103	Same as C101	
C104	Capacitor, 390 pf, 10%, 500V	C0541
C105	Capacitor, 9-35pf TRIMMER	C0709
C106	Capacitor, 47 pf, 10%, 500V	C0533
C107	Capacitor, 500 pf, ±5%, BUTTON TYPE	C1165
C108	Same as C106	
L101	Inductor, 27 µh	L0076
L102	Inductor, 4.7 µh	L0079
L103	Inductor, 6.8 µh	L0053
R101	Resistor, .12K, 5%, 1/2W	R0260
R102	Resistor, 22Ω, 5%, 1/4W	R1436
R103	Resistor, 1.8K, 5%, 1/4W	R0959
R104	Resistor, 330Ω, 5%, 1W	R0662
R105	Same as R103	
R106	Same as R104	
Q101	Transistor, 2N3646	Q0218
Y101	Crystal, 10 MC	Y0046
	Harmonic Gen. PC. Assy	
25123	**Schematic**	
17758	**PC Board**	
C201	Capacitor, 27pf, 10%, 500V	C0530
CR201	Diode, HPA, 0112	CR0261

REFERENCE	DESCRIPTION	PART NUMBER
L201	Inductor, .15 µh	L0080
2E1	Ferrite Bead	H0654
2E2	Same as 2E1	
2E3	Same as 2E1	
2E4	Same as 2E1	
	Video Amp. and Mixer PC Assy	
25123	**Schematic**	
25117	**PC Board**	
C301	Capacitor, 1µF, 25V CER	C0879
C302	Capacitor, .33µF, 25V CER	C0880
C303	Same as C302	
C304	Same as C301	
C305	Capacitor, 100PF, 500V, ±5% MICA	C0874
C306	Capacitor, 33PF, 500V, ±5% MICA	C0531
C307	Same as C301	
C308	Capacitor, 82PF, 500V, ±5% MICA	C0873
C309	Capacitor, 56PF, 500V, ±5% MICA	C0882
C310	Capacitor, 4.7 µF, 35V, Electrolytic	C0878
C311	Capacitor, 47PF, 500V, ±5%, MICA	C0872
C312	Capacitor, .1µF, 50V CER	C0881
C313	Same as C301	
C314	Same as C301	
C315	Capacitor, 6200 PF, 500V, ±5% MICA	C0867
C316	Same as C312	
C317	Capacitor, 500PF, 5% BUTTON TYPE	C0868
C318	Capacitor, .047µF, 20%, 200V, POLY FILM	C0700
C319	Capacitor, .001µF, 20%, 500V, DISC	C0424

REFERENCE	DESCRIPTION	PART NUMBER
CR301	Diode, IN4151	CR0150
CR302	Same as CR301	
CR303	Same as CR301	
CR304	Diode, Semiconductor, #4987/IN416 BM*	CR0262
CR305	Diode, Semiconductor, #4987/IN416 BM*	CR0262
CR306	Diode, HD 1445 Part Marked 0016	CR0263
L301	Inductor, 470µh	L0019
L302	Variable Filter Coil Assy, 2-4µh	19059-2
L303	Same as L301	
L304	Variable Filter Coil Assy, 1-2µh	19059-1
L305	Inductor, 3.3µh	L0077
L306	Inductor, 2.2µh	L0078
Q301	Transistor, 2N3478	Q0177
Q302	Same as Q301	
Q303	Transistor, 2N3646	Q0218
Q304	Same as Q303	
R301	Resistor, 7.5K, 1/4W, 5%	R0884
R302	Resistor, 2.2K, 1/4W, 5%	R0749
R303	Resistor, 1.2K, 1/4W, 5%	R0890
R304	Resistor, 33Ω, 1/4W, 5%	R1550
R305	Same as R303	
R306	Resistor, 360Ω, 1/4W, 5%	R1571
R307	Resistor, 1K, 1/4W, 5%	R0765
R308	Resistor, 27Ω, 1/4W, 5%	R1548
R309	Resistor, 150Ω, 1/4W, 5%	R0983
R310	Same as R302	
R311	Resistor, 4.7K, 1/4W, 5%	R0892
R312	Same as R311	

* CR305 and CR306 are a matched pair

REFERENCE	DESCRIPTION	PART NUMBER
R313	Resistor, 680Ω, 1/4W, 5%	R1234
R314	Resistor, 510Ω, 1/4W, 5%	R0984
R315	Resistor, 390Ω, 1/4W, 5%	R0880
R316	Same as R307	
R317	Resistor, 1.5K, 1/4W, 5%	R0783
R318	Resistor, 100K, 1/4W, 5%	R0741
R319	Resistor, 100Ω, 1/4W, 5%	R0966
R320	Resistor, 5.6K, 1/4W, 5%	R0821
R321	Same as R304	
R322	Same as R304	
R323	Resistor, 150K, 1/4W, 5%	R0961
R324	Resistor, 62Ω, 1/4W, 5%	R1555
R325	Same as R323	
R326	Resistor, 270Ω, 1/4W, 5%	R0694

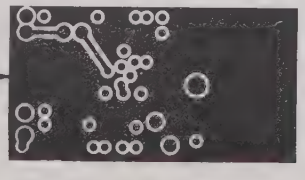


NOTE:

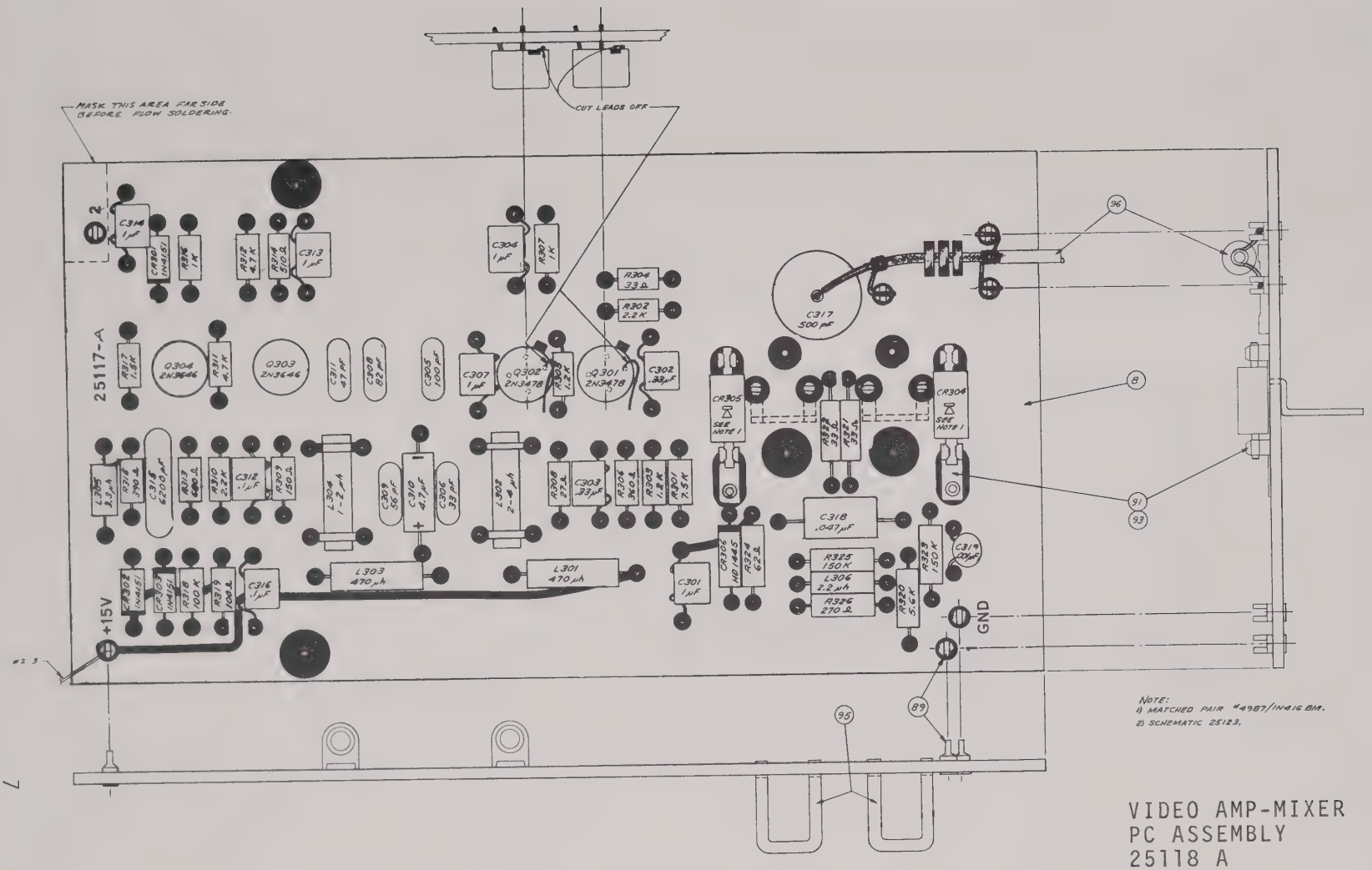
1) C107 & HARMONIC GEN. PC ASS'Y TO BE FLUSH ±.020.

2) SOLDER HARMONIC GEN. PC ASS'Y TO LUG OF C107 & LARGE LUG, ITEM 38.

3) CHECK WIRE SIDE OF BOARD CAREFULLY FOR SOLDER BRIDGES TO GND PLANE. THERE SHOULD BE 31 CIRCUITS NOT CONNECTED TO GND

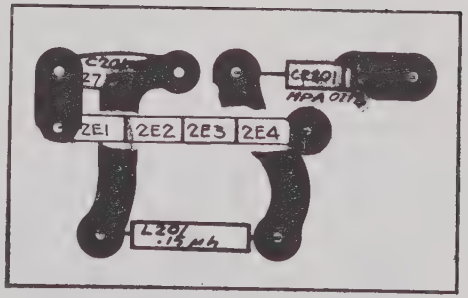


DRIVER AMP
PC ASSEMBLY
25094 A

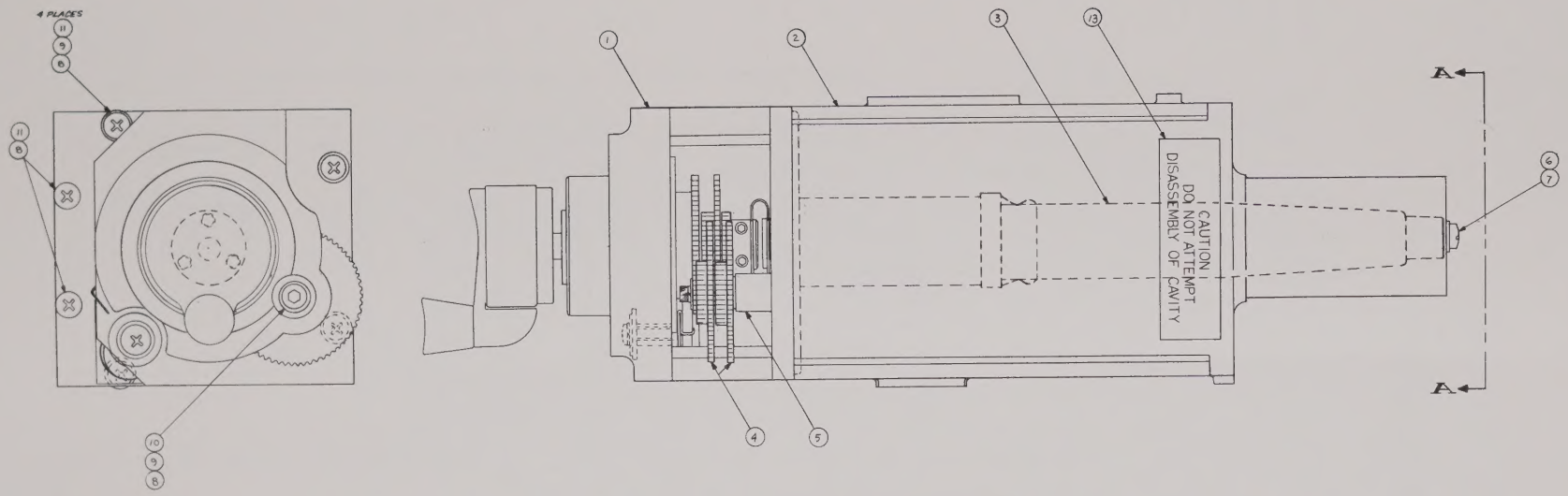


NOTE:
1) MATCHED PAIR #4987/1N416 BM.
2) SCHEMATIC 25123.

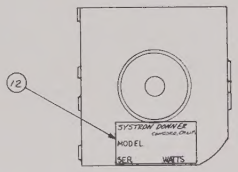
VIDEO AMP-MIXER
PC ASSEMBLY
25118 A



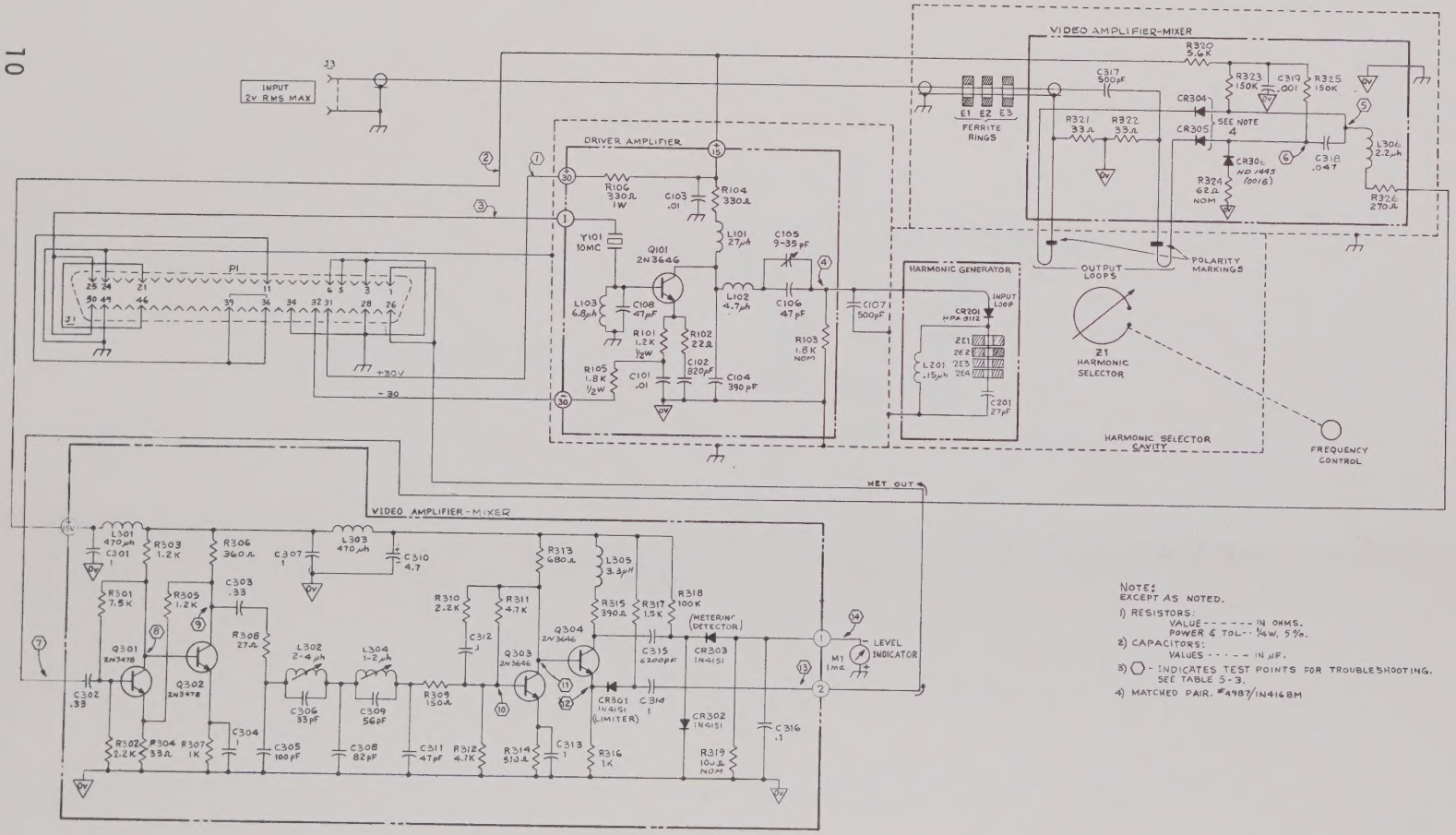
HARMONIC
GENERATOR
PC ASSEMBLY
17759 A



NOTE:
SLUG TRAVEL TO BE LIMITED SO AS TO STOP AT 1/4 TURN OF DRIVE SHAFT BEFORE SLUG TAPER & CAVITY TAPER ENGAGE.



CAVITY ASSEMBLY
25236 A



NOTE:
EXCEPT AS NOTED.

1) RESISTORS:
VALUE - - - - - - - IN OHMS.
POWER & TOL - - ¼W, 5%.

2) CAPACITORS:
VALUES - - - - - IN μF.

3) ⬡ - INDICATES TEST POINTS FOR TROUBLESHOOTING. SEE TABLE 5-3.

4) MATCHED PAIR. #4987/1N4168M

SCHEMATIC
FREQUENCY CONVERTER
(50-500 MC)
25123 A

WARRANTY

Systron-Donner instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. This warranty does not apply to vacuum tubes, except as they are warranted by tube manufacturers. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer at his expense during such period and which has not been subjected to misuse, neglect, improper installations, repair, alteration, or accident. Seller shall have the right of final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warranty is in lieu of any other warranty, express, implied or statutory, and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Systron Donner instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way or fails to operate, a claim should immediately be filed with the transportation company.

REPAIRS

Whenever a Systron-Donner instrument requires service, the nearest Systron-Donner representative should be contacted; all representatives will provide immediate service or arrange factory returns when necessary.

Please specify both model and serial number in all correspondence concerning Systron-Donner instruments. Address all inquiries on operation or applications to your nearest sales representative or Sales Manager, Instruments, Systron-Donner Corporation, 888 Galindo Street, Concord, California.

MP MASTER
MA34156